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Macbeth®
Division of
Kollmorgen Corporation

TR-524 Transmission Reflection Densitometer

Operator's Manual

CHANGE NO. 1

DATE 03/01/80

INSTRUCTION BOOK CHANGE NOTICE

MANUAL AFFECTED Operator's Manual TR-524/ TR-527 (ISSUE DATE: January, 1975)

Page 1-7, Paragraph 1.3.1, Transmission Mode:

Line beginning "Standard instruments contain....." should be deleted; separate circular stage diffusers with aperture inserts installed are no longer provided.

Page 1-6, Paragraph F:

Delete entire paragraph. Replace with:

Place the calibration standard (29005680) on the circular stage diffuser directly over the aperture insert.

Page 1-2, 1-3, 1-4, 1-6, 2-3:

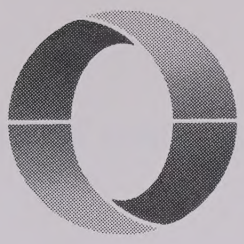
Photographs showing line cords no longer apply.

A removable line cord is now provided.

Macbeth

Macbeth Color & Photometry Division
of Kollmorgen Corporation

P.O. Box 950, Newburgh, New York 12550



Macbeth®
Division of
Kollmorgen Corporation

Operator's Manual for Transmission Reflection Densitometer TR-524

Issue Date:Jan.,1975

TABLE OF CONTENTS

Paragraph		Page
	SECTION 1 - OPERATING INSTRUCTIONS	
1.1	General	1-1
1.2	Operating Procedure	1-1
1.2.1	Reflection Densitometer Mode	1-1
1.2.2	Null Comparator Mode (Reflection)	1-4
1.2.3	Transmission Densitometer Mode	1-5
1.2.4	Null Comparator Mode (Transmission)	1-7
1.3	Changing Aperture Inserts	1-7
1.3.1	Transmission Mode	1-7
1.3.2	Reflection Mode	1-8
	SECTION 2 - OPERATOR'S MAINTENANCE	
2.1	Inspection and Cleaning	2-1
2.2	Fuse Replacement Procedures	2-3
2.3	Light Source Replacement	2-5
APPENDIX A	Filtration Data	A1-1
APPENDIX B	Auxiliary Print Out	A2-1

LIST OF ILLUSTRATIONS

Figure		Page
	SECTION 1. OPERATING INSTRUCTIONS	
1-1	TR-524 Densitometer	1-0

LIST OF TABLES

Table		Page
	SECTION 1. OPERATING INSTRUCTIONS	
	SECTION 2. OPERATOR'S MAINTENANCE	
2-1	Burned Out Fuse Indications	2-4
2-2	Fuse Replacement Data	2-4

This manual contains operating instructions for the TR-524 series of Macbeth instruments listed below:

TR-524

TR-524AD

TR-524MD

TR-524AMD

TR-527

Figure 1-1. TR-524 Series of Densitometers

SECTION 1
OPERATING INSTRUCTIONS

1.1 GENERAL

The TR-524 series of digital readout densitometers (figure 1-1) is composed of standard instruments capable of making color and visual density measurements within the range of 0-4.0 in transmission mode and 0-2.5 in reflection mode. Reflection measurements may be made with Wratten or calibrated Status D Densitometry filtration; transmission measurements may be made with Wratten, calibrated Status A or calibrated Status M Densitometry filtration.

NOTE

For further filtration information refer to Appendix A.

The TR-524 series is wired for 115 or 230 volt operation at 50 or 60 Hz with a total power consumption of approximately 100 watts for standard instruments. Operating voltage and power consumption are indicated on the data plate on the rear panel.

1.2 OPERATING PROCEDURE

CAUTION

The TR-524 series instruments are fan-cooled; to ensure adequate cooling, air flow around the instrument base should not be restricted during operation.

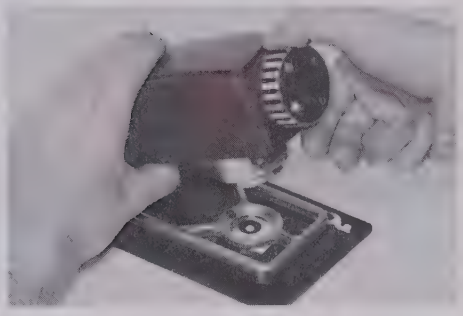
1.2.1 REFLECTION DENSITOMETER MODE

a. Make certain that the a-c input voltage corresponds with the required operating voltage specified on the instrument data plate.

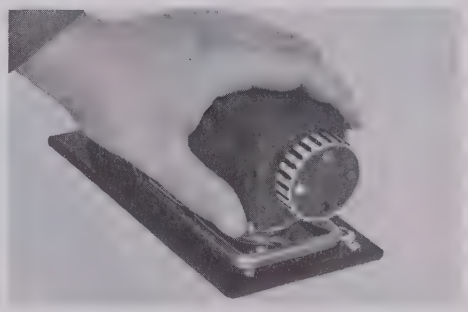
b. Momentarily depress the ON pushbutton. Instrument is ready for operation immmediately; no warm up time is required.

c. Place the reading area locator of the probe on the white area of the 2-step (or 10-step) reflection check plaque.

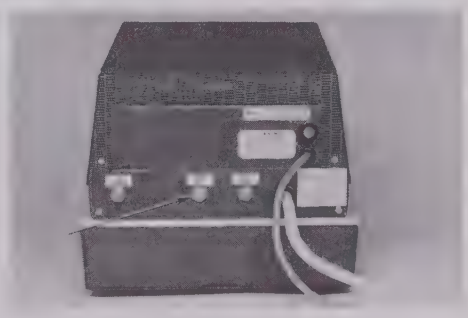
d. Rotate the Filter Selector so that the visual filter (black dot) is in the bottom position.



e. With the reading area locator of the probe centered over the white area of the plaque, depress the probe and press the "Instant Zero" button located at the side of the probe. Release the "Instant Zero" button.



f. Remove the potentiometer cap from the ZERO REFL control on the rear panel. With the probe depressed, adjust the control until the digital display indication corresponds with the value noted on the check plaque.

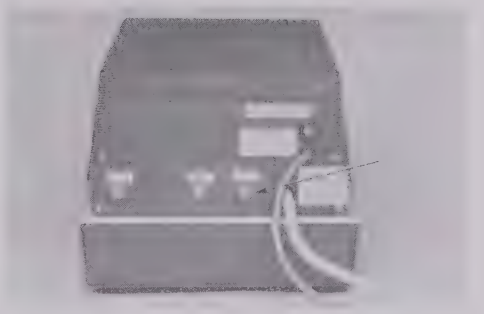


g. With the probe positioned over the white area of the check plaque, rotate the Filter Selector to each of the remaining filter positions. At each filter position, depress the probe and then press the "Instant Zero" button.

h. Position the reading area locator of probe over the black area of the reflection 2-step (or the CAL step of the 10-step) calibration check plaque.

i. Rotate the Filter Selector so that the visual filter (black dot) is in the bottom position. With the reading area locator of the probe centered over the black area of the plaque, depress the probe.

j. Remove the potentiometer cap from the CAL REFL control on the rear panel. With the probe depressed, adjust the CAL REFL control so that the digital display indication corresponds to the density reading noted on the check plaque.



k. Replace the potentiometer cap on the ZERO REFL and CAL REFL controls.

l. Rotate the Filter Selctor to the appropriate filter position for desired measurement (see note below).

NOTE

Color markings on the filter turret correspond with the color of the sample being measured. For additional filtration data, refer to Appendix A.

m. Position the reading area locator of the probe over the sample to be measured and depress the probe. Observe the measured density value on the digital display.

NOTE

It is recommended that setting of the CAL REFL control be checked periodically and adjusted when necessary to ensure the proper operation of the instrument.

1.2.2 NULL COMPARATOR MODE (Reflection)

NOTE

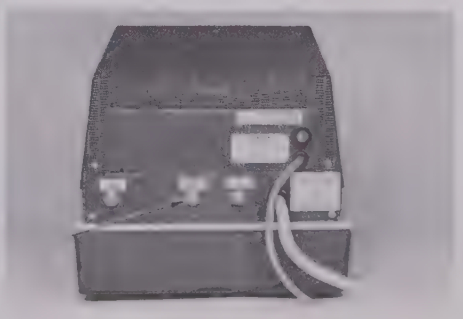
Instrument is capable of reading density differences without operator computation. Digital display will be plus (+) or minus (-) deviation from standard.

a. Turn on, zero adjust, and calibrate the instrument in the conventional mode as described in paragraph 1.2.1.

b. Rotate the Filter Selector to the appropriate filter position.

c. Position the reading area of the probe over the color sample established as the standard.

d. Depress the probe and press the "Instant Zero" button. Remove the potentiometer cap from the ZERO REFL control on the rear panel and adjust for a zero reading. Depress the "Instant Zero" button again. Digital display should now be "0.00." Density of the standard color sample is now memorized.



e. To compare samples to the standard: position the reading area locator of the probe over each sample (of the same color established as standard in "d" above); rotate the Filter Selector to the appropriate filter position and depress the probe. Digital display will indicate plus (+) or minus (-) deviations from the standard.

NOTE

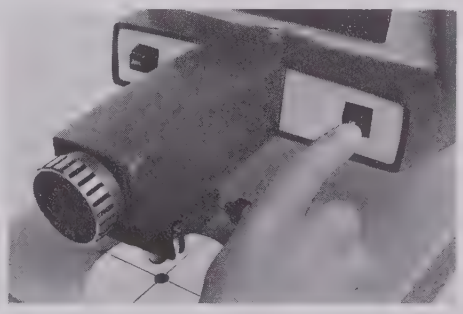
A minus display indicates lighter (or less) density; a plus display indicates darker (or more) density.

1.2.3 TRANSMISSION DENSITOMETER MODE

a. Make certain that the a-c input voltage corresponds with the required operating voltage specified on the instrument data plate.

b. Ensure that the combination of the aperture insert and the setting of the light source attenuator filter are correct for the sample being measured (refer to paragraph 1.3.1/1.3.2).

c. Momentarily depress the ON pushbutton. Instrument is ready for operation immediately; no warm up time is required.



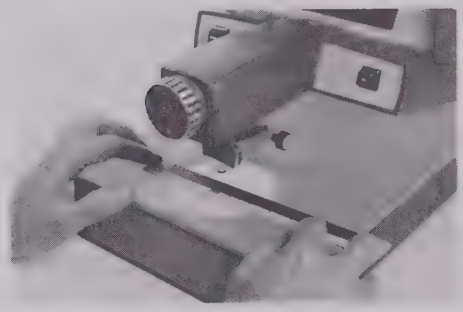
d. Rotate the Filter Selector so that the visual filter (gold dot) is in the bottom position.

NOTE

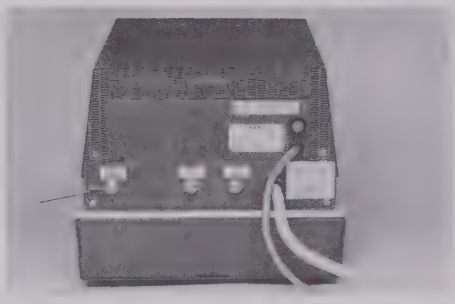
For additional information on filtration, refer to Appendix A.

e. With no sample over the aperture insert, depress the Snout Lever and momentarily depress the ZERO pushbutton on the front panel.

f. Place the calibrated step tablet on the circular stage diffuser; position the step tablet so that the "CAL" step is directly over aperture insert.



g. Depress the Snout Lever and observe the digital display. Remove the potentiometer cap from the "CAL TRANS" control on the rear panel and adjust control until the digital display corresponds with density value for the "CAL" step (as noted on the step table). Remove the tablet.



h. Replace the potentiometer cap on the CAL TRANS control. Repeat step e for each of the remaining filter positions.

i. Rotate the Filter Selector to the desired filter position; place sample to be measured over the aperture insert; depress the Snout Lever and read the measured density on the digital display.

j. When density measurements are to be performed on photographic films, the emulsion side of the sample should face upwards (i.e., towards the collection cone).

NOTE

It is recommended that the CAL TRANS control setting be checked periodically and adjusted when necessary to ensure proper instrument operation.

1.2.4 NULL COMPARTOR MODE (Transmission)

a. Turn on, zero adjust, and calibrate the instrument in the conventional mode as described in paragraph 1.2.3.

b. Rotate the Filter Selector to the appropriate filter position.

c. Position the sample to be established as the standard over the aperture insert.

d. Depress the Snout Lever and observe the digital display. Momentarily depress the ZERO pushbutton on the front panel; the digital display should be "0.00." Remove the sample from the stage diffuser.

e. To compare samples to the standard: position the sample over the aperture insert and depress the Snout Lever; the digital display will indicate plus (+) or minus (-) deviation from the reading of the sample established as standard.

NOTE

A minus display indicates lighter (or less) density; a plus display indicates darker (or more) density.

1.3 CHANGING APERTURE INSERTS

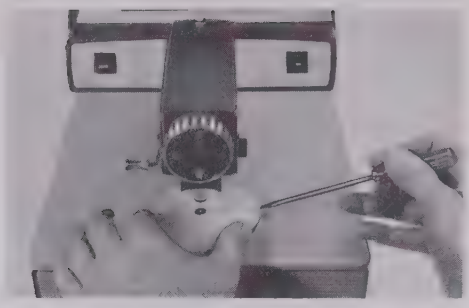
1.3.1 TRANSMISSION MODE

Because it is more frequently used, the 2-mm aperture insert is installed in the TR-524/TR-527 when shipped from the factory. Standard instruments contain circular stage diffusers with aperture inserts installed. These inserts can be replaced with a 1-mm or 3-mm aperture insert (provided as accessory items) in order to read smaller or larger areas respectively.

NOTE

Standard instruments (TR-524AD, TR-524MD and TR-524AMD) using calibrated Status filters function with a 3-mm insert in transmission mode.

a. Using a small screwdriver, carefully lift the circular stage diffuser from the stage base.



b. Set the light source attenuator filter at the proper position corresponding to the new aperture insert. When using calibrated Status filters, set the light source attenuator filter to the 1-mm position.

c. Replace the circular stage diffuser (complete with new aperture insert) in the stage base of the instrument.

1.3.2 REFLECTION MODE

The reading area locator at the base of the reflection probe is fixed at 3/16 inch (4.78-mm) for the TR-524 series and 1/8 inch (3.18-mm) for the TR-527 series.

SECTION 2

OPERATOR'S MAINTENANCE

2.1 INSPECTION AND CLEANING

Dust, dirt, moisture and other destructive environmental elements can contribute to equipment malfunction; therefore, the optical system should be inspected and cleaned periodically. The frequency of this inspection and cleaning should, of course, be dependent upon: (1) the frequency of instrument usage; and (2) the environmental conditions. A camel-hair brush or lens tissue should be used for cleaning.

CAUTION

Ensure that the a-c input power has been disconnected from the instrument prior to performing the inspection and cleaning routines.

a. Using a small screwdriver, remove the circular stage diffuser from the stage base and inspect the aperture insert for dust and dirt.

b. Inspect the light attenuating filters, folding mirror, and imaging lens for accumulation of dust, dirt, or possible scratches and cracks.

c. Remove the circular access plate from the bottom of the stage base and inspect the light source and reflector for dust, dirt, or grease (see note below).

NOTE

If the light source is touched with bare fingers, it must be cleaned with isopropyl alcohol before a-c power is applied to the instrument.

d. Remove the filter turret by rotating the Filter Selector 45° in either direction to move it off detent; lift the turret out by hand. The turret is held by a spring-loaded detent mechanism and requires no tools for removal.

e. Inspect the filters for cracks, dust, or dirt.

f. Clean the filters with a camel-hair brush. Do not use lens cleansing tissue.

g. Replace the filter turret, access plate, and circular stage diffuser.

NOTE

Filter turrets for the TR-524 and TR-527 are identical with respect to removal and replacement procedures.

h. Inspect the reading area locator and probe stand for damage and accumulation of dust or dirt.

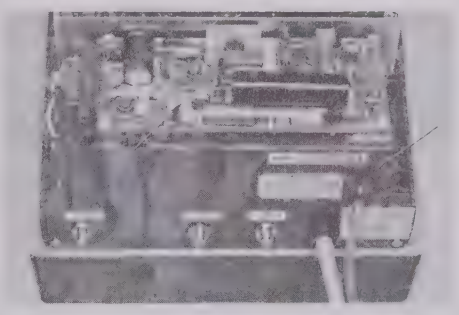
i. Inspect the light source and annular ring for accumulation of dust, dirt or other foreign matter.

2.2 FUSE REPLACEMENT PROCEDURES

CAUTION

Disconnect the a-c input power before attempting to replace fuses.

There are two fuses used in the instrument: (1) fuse F401 located on the rear chassis panel; and (2) fuse F402 located on the power supply printed circuit board. No special instructions are needed to replace either fuse; however, in order to gain access to fuse F402, it is necessary to first remove the instrument top cover.



To remove cover:

a. Loosen and remove the two top cover retaining screws from the rear panel of the instrument.

b. Lift the cover slightly upwards and backwards so that the locking flanges on the front of the cover clear the instrument housing. Remove the cover and set it aside.

Indications of a burned out fuse are given in table 2-1; replacement fuses must comply with information given in table 2-2.

TABLE 2-1. BURNED OUT FUSE INDICATIONS

INDICATION	FUSE
Instrument is inoperative	F401
Optical light source is bright and digital is 8.88	F402

TABLE 2-2. FUSE REPLACEMENT DATA

FUSE	RATING	DESCRIPTION
F401		
100 vac operation	1 1/2 amp, 250V	#3AG, 1/4 in (6mm) x 1 1/4 in (32mm), cartridge, Slo-Blo (Macbeth Part #31015000).
115 vac operation	Same as for 100 vac	Same description as above.
230 vac operation	3/4 amp, 250V	Same description as above (Macbeth Part #31007000).
F402	1/4 amp, 250V	Same description as above except Macbeth Part #31002001.

CAUTION

Do not replace a fuse with one of a larger size. If a fuse burns out immediately after replacement, do not replace it a second time until the cause has been located and corrected.

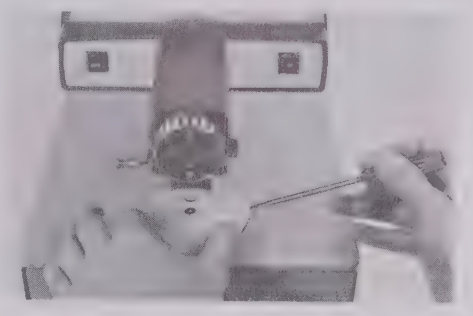
2.3 LIGHT SOURCE REPLACEMENT

A spare lamp for the transmission optical system is provided as an accessory item with the instrument and is contained in the stage base. If additional lamps (Macbeth Part #30950000) are required, they should be obtained directly from the Macbeth Division, Kollmorgen Corporation, Newburgh, NY 12550.

CAUTION

Ensure that the a-c input power has been disconnected from the instrument.

a. Using a small screwdriver, remove the circular stage diffuser from the stage base and set it aside.



b. Carefully set the instrument on its side. Loosen and remove the three screws securing the circular access plate to the instrument base. Set the access plate aside.

c. Using an offset screwdriver, loosen (do not remove) the two screws securing the lamp-socket assembly to the lamp holder bracket.

d. Carefully slip the lamp-socket assembly free of the lamp holder bracket. Lift the lamp-socket assembly out of the instrument base.

e. Loosen (do not remove) the two screws securing the lamp socket stiffener plates to the lamp socket. Remove the lamp from the socket.

IMPORTANT

Spare lamps (Macbeth Part #30950000) are provided with a protective cover. This cover should be left in place until lamp is completely installed. If lamp is touched with bare fingers, it must be cleaned with isopropyl alcohol before a-c power is applied.

f. Install the new lamp in socket; ensure that the lamp prongs are fully seated in the socket; tighten the screws securing the socket stiffener plates to the lamp socket.

g. Remount the lamp socket assembly to the lamp-holder bracket; do not tighten the screws. Connect instrument to a-c input power; set POWER switch to ON.

NOTE

Steps h through j constitute the electronic centering adjustment for the optical light source.

CAUTION

The electrical leads for the light source DS1 carry 9 volts a-c. Caution should be exercised when working near an energized light source. Do not short circuit the lamp leads.

h. Replace the circular stage diffuser. Depress the Snout Lever and hold it down. Momentarily depress the ZERO pushbutton on the front panel. The digital display should indicate "0.00."

i. Slowly move the lamp socket assembly from side to side while observing the digital display. The digital display indications should reflect plus (+) and minus (-) readings.

j. Position the lamp socket assembly to the location resulting in the maximum minus (-) digital display indication and tighten the screws securing the lamp socket assembly to the lamp-holder bracket. Release the Snout Lever.

NOTE

Maximum minus (-) reading of the digital display is an indication of the maximum passage of light flux from the light source through the aperture to the light detector.

k. Reassemble the instrument in the reverse order of disassembly.

APPENDIX A. FILTRATION DATA

Dependent upon the instrument application, four Wratten or four optional filters are mounted in the color filter turret of the instrument. Each TR-524/TR-527 series instrument contains two filter turrets: one for reflection measurements; and one for transmission measurements. The filter turrets are differentiated by the color of the visual position indicator. The probe (reflection) contains a black dot while the snout (transmission) filter turret contains a gold dot. In the reflection turret, the color dots correspond with the color of the sample being measured. In the transmission turret, however, the color dots indicate the color of the filter being used to make the transmission measurements.

CAUTION

The filters used for reflection and transmission densitometry have different absorption characteristics; therefore, the filter turrets cannot be interchanged.

FILTRATION OPTIONS

REFLECTION PROBE:

FILTER TURRET POSITION	FILTER COLOR	FILTER	
		STANDARD	OPTIONAL*
Magenta	Green	Wratten #58	Calibrated filters as
Cyan	Red	Wratten #25	used in Status D
Yellow	Blue	Wratten #47	Densitometry.
Black	Visual	Wratten #106	

*Optional filtration applicable to TR-524 instruments only.

TRANSMISSION PROBE:

FILTER TURRET POSITION	FILTER COLOR	FILTER		
		STANDARD	OPTION I	OPTION II
Green	Green	Wratten #93	Calibrated	Calibrated
Red	Red	Wratten #92	filters as	filters as
Blue	Blue	Wratten #94	used in	used in
Gold	Visual	Wratten #106	Status A	Status M
		(&CC10R)	Densitometry	Densitometry

MODEL OPTIONS AND FILTRATION

MODEL	TRANSMISSION	REFLECTION
TR-524	Standard	Standard
TR-524AD	Option I (Status A)	Option (Status D)
TR-524MD	Option II (Status M)	Option (Status D)
TR-524AMD	Option I/Option II (interchangeable)	Option (Status D)
TR-527	Standard	Standard

APPENDIX B. AUXILIARY PRINT OUT (TR-524/TR-527)

The TR-524/TR-527 instruments contain facilities to enable the transmission of density readings and filter identification (via BCD output signals) to auxiliary print out equipment. As a customer option, the BCD kit (Macbeth Part #59000100) is available for installation at the factory or by an authorized Macbeth service company.

NOTE

Input signal connections for the auxiliary print-out device are unique to the specific equipment used. Information regarding these units must be obtained from the appropriate manufacturer.

Warranty

Seller warrants that at the time of shipment from Seller's factory, the goods supplied hereunder will be of the kind described herein and in any specifications or drawings referenced herein and will be free from defects in material and workmanship. Such warranties are further conditioned upon any claim pursuant to such warranties being made, in the manner herein below set forth, within one (1) year following the date of customer's receipt of the goods.

These warranties shall not apply to any goods supplied hereunder which after Seller's shipment are damaged, altered in any respect, or subjected to negligent treatment. Lamps, vacuum tubes, fuses, air filters, and other expendable components of the goods supplied hereunder are not warranted in any respect.

Seller's sole and exclusive obligation for breach of the above warranties shall be the repair or replacement of any part (or the complete units, at Seller's option), without charge, which within the warranty period is proven to the Seller's reasonable satisfaction to have been defective, provided further, that the Seller may require the return to its factory of the allegedly defective material or goods in order to establish the claim. Buyer will bear any transportation costs incurred.

Repairs or replacements by Seller shall not revive an otherwise expired warranty, nor shall the same extend the duration of a warranty.

The Seller shall in no event be liable for losses or costs to Buyer in manufacturing, or for Buyer's overhead, other expenses, lost profits, goodwill, or any other special, indirect, consequential, incidental, or other damages to persons or property resulting from a breach of any of the foregoing warranties.

THERE ARE NO OTHER WARRANTIES, EXPRESS OR IMPLIED, WHICH EXTEND BEYOND THE WARRANTIES SET FORTH HEREIN. THE EXPRESS WARRANTIES CONTAINED HEREIN ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OR MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. NO REPRESENTATIONS OR STATEMENTS NOT EXPRESSLY SET FORTH HEREIN SHALL BE BINDING UPON SELLER AS A WARRANTY OR OTHERWISE.

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SERVICE GUIDELINES

Your Macbeth instrument has been designed and manufactured to provide the utmost in accuracy, productivity, and reliability. Our goal is to increase your profits by providing a tool that can increase productivity, assure product quality, and reduce material waste.

The operator manual explains the periodic maintenance and cleaning procedures. This maintenance can be accomplished in minimal time and will assure the accuracy and reliability of your instrument.

TO OBTAIN SERVICE

If your instrument requires service beyond your scope, we have a service network ready to serve your needs. The attached list indicates the locations of our service centers. Each service center is factory authorized, factory trained, and fully equipped to provide fast, effective service for you. If you need service, contact the service center nearest you. The service centers are authorized to perform both in-warranty and out-of-warranty service.

Factory service is available at Macbeth in Newburgh, New York. Due to increased transit and handling time to our factory from many locations, the nearest service center to you can provide the fastest service.

IF YOU ARE MAKING A CLAIM FOR WARRANTY SERVICE, YOU MUST INCLUDE PROOF OF PURCHASE WITH THE INSTRUMENT. The proof of purchase must identify the instrument serial number and the date shipped to or received by you. A copy of the invoice or packing slip will usually suffice.

TO EXPEDITE SERVICE

To insure fast service, and protect your investment, please follow these guidelines:

1. Contact your nearest servicecenter; describe your problem, it may be an adjustment you can perform yourself.
2. Advise the servicecenter of the urgency required.
3. Determine a fast, reliable carrier to forward your instrument to the servicecenter.
4. Package the instrument adequately, use the original container if available. The container should be heavy guage corrugated. Envelope the instrument in plastic bubble pack or equivalent. Support the snout of a transmission model with rolled corrugated.
5. Enclose the service request form in the container, provide all information requested. An accurate description of malfunction will help reduce repair time. Specifying the return carrier will help reduce return shipment time.

SERVICE EVALUATION

Maintaining and improving our service capabilities is a continuous program at Macbeth. If you are ever dissatisfied with our service performance - please let us know. Our function is to serve you in an efficient, effective manner - your experiences are important to us. A postage-paid, service evaluation card is enclosed for your use.

Feel free to contact Joe Casscles or myself at Macbeth whenever the need arises.

Sincerely,

David G. Decker
Service Manager

Joseph P. Casscles
Service Specialist

FOR YOUR CONVENIENCE

We've bound this over-sized envelope into your Manual. In addition to providing a protected storage spot for the accessories of your instrument, it will be a handy place for you to keep all of the records and standards which you'll want to save for future reference.

macbeth

news & notes

REFLECTION DENSITOMETER

OPERATOR'S MAINTENANCE

The instrument's optical system should be inspected and cleaned periodically. The frequency of this inspection and cleaning should be performed on a scheduled basis regardless of frequency of use or environmental operating conditions.

A camel-hair brush, a pipe cleaner, or a lens tissue should be used for cleaning. If this inspection reveals a need for technical service, refer to the service guide lines enclosed.

A. Make certain that a-c power is disconnected from instrument.

B. Inspect reading-area location, and probe stand for damage or accumulation of dirt/dust.

C. Inspect light source and annular ring for accumulation of dirt, dust, or any foreign matter. Clean with folded pipe cleaner.

D. Remove filter turret by rotating filter selector 45° in any direction to get it off detents and pull turret out by hand. Turret is held by spring-loaded detent mechanism and requires no tools for removal.

E. Inspect filters for cracks or dust/dirt. Clean as required with camel-hair brush.

F. Replace turret.

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A division of
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Little Britain Rd., Drawer 950, Newburgh, N.Y. 12550 • (914) 561-7300

macbeth prints

C. 1

INSTRUMENT SPARE PARTS

TR-524, TR-527

DESCRIPTION	PART NUMBER
Electrical	
Cable, Probe	05390911
Circuit Board, Digital Readout	10004840B-10015470
Circuit Board, Dynode Feedback	10004710B-10014370
Circuit Board, Instant Zero	10004870B-10015480
Circuit Board, Power Supply	10004250B
Circuit Board, Interface	10007680B
*Fuse, 1/4 Amp	31002001A
*Fuse, 3/4 Amp. Slo-Blo (230V. Operation only)	31007000A
*Fuse, 1 1/2 Amp, Slo-Blo	31015000A
*Light Source Ass'y (TR-524)(RD) (TR-524AD)	29000030B
*Light Source Assembly (TR-527)	29000380B
*Light Source, Osram #64610 (TD)	30950000A
Magnet, Bar	12000610A
*Motor, Blower	03000050A
Power Supply Complete	10004240B
*Switch, Instant Zero(RD probe)	43010211A
*Switch, Instant Zero (TD)	43010118A
Switch, Micro SPDT (RD probe)	43010208A
*Switch,Micro (TD Snout)	43010200A
*Switch, On-Off	43020102A
Switch, Reed Bracket Ass'y	10003090B
Solar Cell Ass'y	29002520B
Tube, Display,RCA DR2100 (CL,RH)	46000031A
Tube, Display,RCA DR2110(CR)	46000030A
Tube, Display,RCA DR2120(LH)	46000032A
Tube, Photomultiplier	12000420B
RELAY	35056000A
Mechanical	
Ball, Nylon, Filter Turrent Detent	51000100A
Button, Zero	07001370A
Button,On	07001371A
*Cam	21001400B

*Items designated with an asterisk are recommended spare parts

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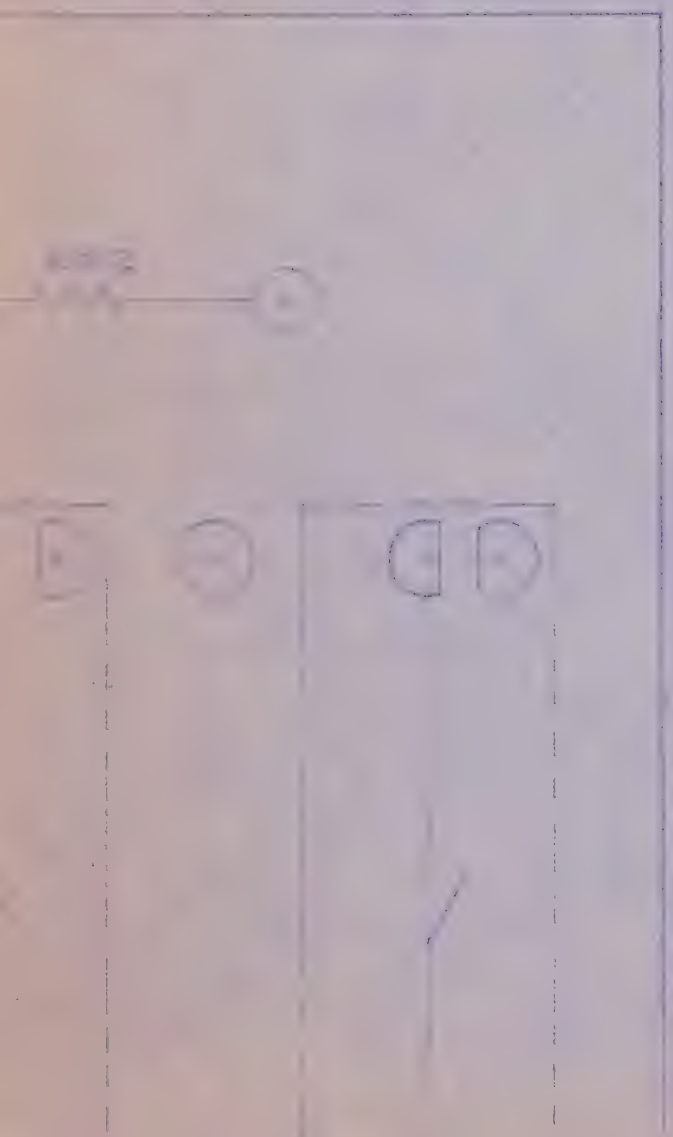
Little Britain Rd., Drawer 950, Newburgh, N.Y. 12550 • (914) 561-7300 Telex 96-8453 • Cable MACBETH NBUR

TR-524,TR-527 Con't

DESCRIPTION	PART NUMBER
Mechanical Con't	
Diffuser, Stage Disc W/1mm Aperture	23006610B
Diffuser, Stage Disc W/2mm Aperture	23006620B
Diffuser, Stage Disc W/3mm Aperture	23006630B
Disc, Stage (TR-524,TR-524AD)	29000560A
Disc, Stage (TR-527)	29000561A
Filter Turret Ass'y with Filters (92,93,94,106)	29002750B
Filter Turret Ass'y Calib AA (TR-524AD) reflection head	29000960B
Filter Turret Ass'y Calib AA (TR-524A,D) Transmission head	29000952B
Filter Turret Ass'y Calib MM (TR-524M,AM,AMD)	29000953B
Filter Turret Assy W/out Filters(TD)	23005220B
Filter Turret Assy W/out Filters(RD)	23005980B
Foot, Rubber	51400700A
*Light Seal	51400320B
Ring, Retaining	53480000A
Rings, Retaining, Filter(Pkg 6)	23006050A
Screw, Snout Guide	21001100A
Screw, Stabilizing, PM Housing	21003900B
Spacer, Rubber	51400140A
Spring, Filter Turret Detent	50000400A
Spring, Probe Return	50000500A
Spring, Snout Return	50000100A
Spring, Snout Tension	50000200A
Optical	
Filter, Correction,Masked (3.0)	27001830A
Filter, Correction,Masked (3.5)	27001831A
Filter, Correction,Masked (4.0)	27001832A
Filter, Correction,Masked (4.5)	27001833A

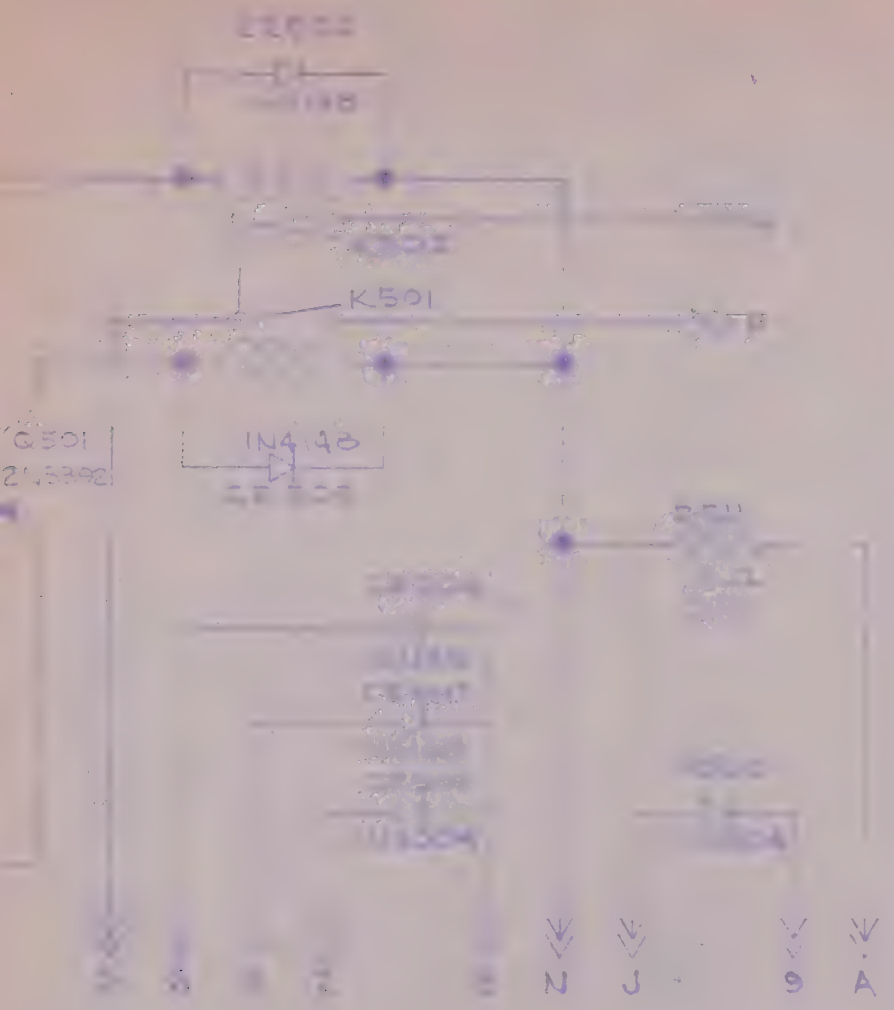
*ITEMS designated with an asterisk are recommended s



	COMPONENT DESIGNATION	AGASTAT PART NO.
	R501, R502, R505, R506	[illegible]
	R503, R504	[illegible]
	R507	36401007
	R508	36832501
	R509	36402000
	R510	36220001
	R511	36150000
	R512	36472012
(B)	R513	36212002
(G)	C501	[illegible]
(F)(E)		
(D)	[illegible]	[illegible]
(A)	CR501, CR502	[illegible]
	CR503, CR504 CR505, CR506	[illegible]
	CR507, CR508	[illegible]
	Q501	[illegible]
(C)	Q502	[illegible]

10001690

411000 55



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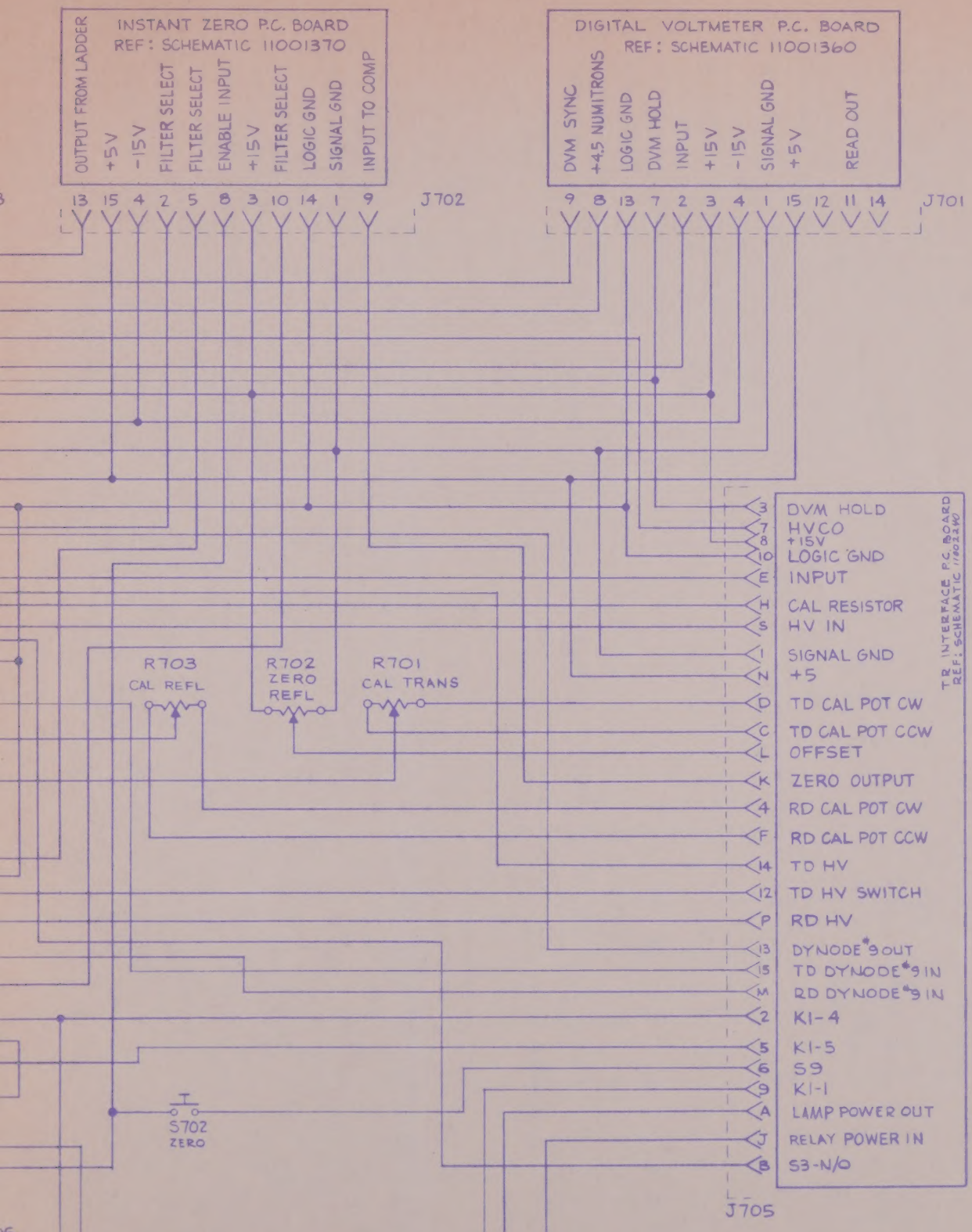

MODEL	ASSEMBLY
TR524	13005240

REVISIONS

(A) R1- R9 (5 PLACES) 2.21K 1% WAS 2.10K 1% ECN 825 PM FH

(B) "CAL REFL" WAS "CAL" "CAL TRANS" WAS "S" "ZERO REFL" WAS "OFFSET" ADDED CONNECTION "G" TO "15V FROM PIN 5, J701 TO PIN 8, J705; PIN M, J705 WAS PIN 11, PIN J, J705 WAS LAMP POWER IN. ECO #00850 JY

(C) DELETED TB 701 FIGURE NOT ECO 0151

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STANDARD TOLERANCE - UNLESS OTHERWISE NOTED				
DESCRIPTION	MAX.	METR	FRAC.	DEC.
LINEAR	IN	±	1/64	.005
ANGULAR	DEG.	±	1	.50
CONCENTRICITY	IN	TIR	1/64	.005
FLAT/STRAIGHT	IN	TIR	1/64	.005
SQUARE/PARALLEL	LN	TIR	1/64	.005
SURFACE FIN.	μIN	TIR	63	63
BURR & BREAK EDGES .005 MAX.				

MACBETH CORPORATION
NEWBURGH, N.Y. - 12550

TITLE: SCHEMATIC-TR524 INTERCONNECTION

MATERIAL	FINISH	DRAWN GEO. N	CHKD	APPD	DATE 2-27-81
		SCALE ~	PART NO. 11002170		REVISION C

Macbeth
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Kollmorgen Corporation

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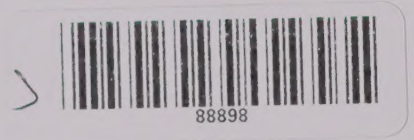
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